TITLE OF THE INVENTION

HERMETIC COMPRESSOR

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Korean Application No. 2003-25567, filed April 22, 2003, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates, in general, to hermetic compressors and, more particularly, to a hermetic compressor, in which an exhaust chamber part to temporarily store therein compressed gas discharged from a cylinder bore prior to exhausting the compressed gas to an outside of a hermetic casing of the compressor, is provided at a cylinder head, in place of a cylinder block, thus preventing deformation of the cylinder block and allowing easy and simple production of the cylinder block.

Description of the Related Art

As well known to those skilled in the art, hermetic compressors typically have a compression unit to compress inlet gas, a drive unit to operate the compression unit, and a hermetic casing to hermetically house the compression unit and the drive unit therein. The hermetic compressors suck the gas into the hermetic casing, and compress the gas, prior to discharging the compressed gas to an outside of the hermetic casing. The

hermetic compressors are typically used in refrigeration circuits of a variety of refrigeration systems, such as air conditioners and refrigerators, so as to compress low-pressure gas refrigerant returned from an evaporator of the refrigeration circuit, thus producing high-pressure gas refrigerant and discharging the high-pressure gas refrigerant to a condenser of the refrigeration circuit.

In the hermetic compressors, the compression unit includes a cylinder block and a piston, while the drive unit includes a stator and a rotor. Examples of the hermetic compressors are hermetic linear compressors and hermetic reciprocating compressors. In a conventional hermetic linear compressor, a piston to which a rotor of a drive unit is mounted performs a rectilinear reciprocating action to compress the gas. In a conventional hermetic reciprocating compressor, a rotating shaft penetrates a rotor of a drive unit and is connected to a piston, so that the piston performs a rectilinear reciprocating action in response to a rotating action of the rotating shaft, thus compressing the gas.

In the conventional hermetic compressors, a cylinder block defines an axial cylinder bore therein. The cylinder bore of the cylinder block receives the piston therein, and defines a space therein to compress the gas. A cylinder head is mounted to an upper end of the cylinder block to cover the cylinder bore.

The cylinder block, to which the cylinder head is mounted, is provided with an exhaust chamber part to temporarily store therein the compressed gas discharged from the cylinder bore, prior to exhausting the compressed gas to an outside of the hermetic casing of the compressor. The exhaust chamber part has a chamber body which is covered with a chamber cover to define a predetermined exhaust chamber therein.

However, the conventional hermetic compressors having the above-mentioned construction is problematic, as follows. That is, the exhaust chamber part is formed in

the cylinder block, thus complicating the structure of the cylinder block and making it difficult to produce the cylinder block. In addition, it is necessary to lock the chamber cover to the chamber body by tightening a plurality of bolts with high torque to accomplish an airtight sealing effect at a junction between the chamber cover and the chamber body. However, the high-torque locking of the chamber cover to the chamber body of the exhaust chamber part by use of the bolts may cause a deformation of the cylinder block, and, sometimes cause damage or breakage of the cylinder block.

Particularly, it is necessary to precisely arrange the piston in the cylinder bore of the cylinder block with a minute clearance defined between the piston and the cylinder bore. However, when the cylinder bore is deformed during a process of bolting the chamber cover to the chamber body of the exhaust chamber part with the high torque, it is almost impossible to precisely arrange the piston in the cylinder bore with the desired minute clearance defined between the piston and the cylinder bore. In such a case, the gas may leak in the cylinder bore through a junction between the piston and the cylinder bore, or the piston may be locked to an inner surface of the cylinder bore. When the piston is locked to the inner surface of the cylinder bore, the piston cannot perform a reciprocating action in the cylinder bore.

Furthermore, since the high-pressure and high-temperature gas is temporarily stored in the exhaust chamber part of the conventional hermetic compressors, the cylinder block integrated with the exhaust chamber part is heated by the high-pressure and high-temperature gas to a high temperature, thus increasing the temperature of the inlet gas which flows into the cylinder bore. In such a case, the inlet gas is reduced in volume efficiency thereof, and the hermetic compressor is reduced in gas compression efficiency thereof.

SUMMARY OF THE INVENTION

Accordingly, it is an aspect of the present invention to provide a hermetic compressor, in which an exhaust chamber part is placed at a position free from causing deformation of a cylinder block, and which allows easy and simple production of the cylinder block, without causing a reduction in volume efficiency of inlet gas sucked into the cylinder bore.

Additional aspects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

The foregoing and other aspects of the present invention are achieved by providing a hermetic compressor, including: a casing; a cylinder block installed in the casing, with a cylinder bore defined in the cylinder block; a piston placed in the cylinder bore so as to reciprocate in the cylinder bore; a cylinder head mounted to an end of the cylinder block so as to cover the cylinder bore; and an exhaust chamber part provided at the cylinder head so as to temporarily store compressed gas discharged from the cylinder bore, and exhaust the compressed gas to an outside of the casing.

The exhaust chamber part includes a chamber body integrally formed at a side of the cylinder head, the chamber body being open at a top thereof to define an exhaust chamber therein; and a chamber cover to cover the open top of the chamber body.

The chamber body includes two bored cylindrical parts which are arranged in parallel to each other and integrally coupled to each other such that the exhaust chamber is divided into first and second chambers communicating with each other, and the chamber cover includes two dome-shaped parts which are arranged in parallel to each other and integrally coupled to each other so as to correspond to a shape of the

chamber body.

In the hermetic compressor, an exhaust pipe is provided at the chamber body at a position between the first and second chambers, thus exhausting the compressed gas from the first and second chambers to the outside of the casing.

In the hermetic compressor, a first boss having a first bolt hole and a second boss having a second bolt hole are projected toward the chamber cover in the first and second chambers of the chamber body, respectively, and first and second through holes are formed in the chamber cover at positions corresponding to the first and second bolt holes, respectively, so that the chamber cover is mounted to the chamber body by use of bolts which are respectively tightened to the first and second bolt holes while passing through the first and second through holes.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a longitudinal sectioned view of a hermetic compressor, according to an embodiment of the present invention;

FIG. 2 is an exploded perspective view of a part of the hermetic compressor of FIG. 1 to show a cylinder head integrally provided with an exhaust chamber part, when the cylinder head is disassembled from a cylinder block; and

FIG. 3 is a perspective view of the part of the hermetic compressor of FIG. 1 to show the cylinder head completely assembled with the cylinder block.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

FIG. 1 is a longitudinal sectioned view of a hermetic compressor, according to an embodiment of the present invention. As shown in the drawing, the hermetic compressor according to the present invention has a hermetic casing 1 that hermetically houses a drive unit 10 and a compression unit 20 therein. The hermetic compressor thus sucks and compresses gas, such as a gas refrigerant circulating through a refrigeration circuit of a refrigeration system, prior to discharging the compressed gas to an outside of the hermetic casing 1.

In the hermetic compressor, the compression unit 20 includes a cylinder block 1, a cylinder head 23, a piston 24, a frame 25, a plurality of spacers 26, a resonant spring 27, and a movable member 28. The cylinder block 21 defines an axial cylinder bore 22 therein, and the gas is compressed in the cylinder bore 22. The cylinder head 23 is mounted to an upper end of the cylinder block 21 to cover the cylinder bore 22. The piston 24 is placed in the cylinder bore 22 such that the piston 24 reciprocates in an axial direction to compress the gas in the cylinder bore 22. The frame 25 and the plurality of spacers 26 are mounted to a lower end of the cylinder block 21, while the resonant spring 27 is horizontally mounted to lower ends of the spacers 26. The movable member 28 connects the piston 24 to the resonant spring 27. A suction muffler 29 and an exhaust chamber part 40 are provided at both sides of the cylinder head 23, respectively. A suction valve 30 and an exhaust valve 31 are provided in the cylinder head 23.

The drive unit 10 includes first and second stators 11 and 12, a coil 13, and a permanent magnet 14. The first and second stators 11 and 12 are concentrically mounted around an outer surface of the cylinder block 21, with a gap defined between the first and second stators 11 and 12. The coil 13 is wound in an interior of the first stator 11. The permanent magnet 14 is installed on the movable member 28 which extends into the gap defined between the first and second stators 11 and 12, such that the permanent magnet 14 is moved along with both the piston 24 and the movable member 28.

The drive unit 10 and the compression unit 20 are supported in the hermetic casing 1 while being suspended by a plurality of coil springs 2. When electric power is applied to the coil 13 during an operation of the hermetic compressor, an electromagnetic field is generated along the first and second stators 11 and 12, so that the permanent magnet 14 linearly reciprocates in a vertical direction due to the electromagnetic field. Therefore, both the movable member 28 and the piston 24 reciprocate in the vertical direction. In such a case, the reciprocating action of the piston 24 is enhanced by a resonance of the resonant spring 27.

During the reciprocating action of the piston 24, the suction valve 30 and the exhaust valve 31 are alternately opened. Therefore, gas is sucked into the cylinder bore 22 through the suction muffler 29 so as to be compressed, and is discharged from the cylinder bore 22 to the exhaust chamber part 40.

An arrangement of the exhaust chamber part of the hermetic compressor according to the present invention will be described in detail herein below, with reference to FIGS. 2 and 3.

FIG. 2 is perspective views of a part of the hermetic compressor of the present invention, in which FIG. 2 shows the cylinder head when the cylinder head having the

exhaust chamber part is disassembled from the cylinder block, and FIG. 3 shows the cylinder head completely assembled with the cylinder block.

As shown in FIG. 2, the exhaust chamber part 40 is integrally provided at a first side of the cylinder head 23 which covers the cylinder bore 22 at the upper end of the cylinder block 21. The suction muffler 29 is provided at a second side of the cylinder head 23, which is opposite to the first side of the cylinder head 23 having the exhaust chamber part 40. Due to the suction muffler 29 of the cylinder head 23, the gas is introduced into the cylinder bore 22 through the cylinder head 23. The gas is compressed in the cylinder bore 22, and the compressed gas is discharged from the cylinder bore 22 to the exhaust chamber part 40.

The exhaust chamber part 40 has a chamber body 41 and a chamber cover 42. The chamber body 41 defining an exhaust chamber therein has two bored cylindrical parts which are each open at a top thereof and are arranged in parallel to each other while being coupled to each other. The chamber body 41 having the above-described structure is integrally formed at the cylinder head 23. The chamber cover 42 is mounted to the open top of the chamber body 41 to cover the open top of the chamber body 41.

Therefore, the chamber body 41 has therein first and second chambers 43 and 44 which communicate with each other and temporarily store the compressed gas therein. The chamber cover 42, which covers the open top of the chamber body 41, has two dome-shaped parts which are arranged in parallel to each other while being coupled to each other so as to correspond to the shape of the chamber body 41.

First and second exhaust ports 45 and 46 are formed in the cylinder head 23 at positions corresponding to the first and second chambers 43 and 44, respectively, so as to guide the compressed gas from the cylinder head 23 into the first and second chambers 43 and 44. An exhaust pipe 47 is formed at the chamber body 41 at a

position between the first and second chambers 43 and 44, thus exhausting the compressed gas from the first and second chambers 43 and 44 to the outside of the casing 1.

In order to mount the chamber cover 42 to the open top of the chamber body 41 integrally formed at the cylinder head 23 by use of a plurality of bolts 54, first and second bosses 48 and 50 are projected from a bottom of the chamber body 41 toward the chamber cover 42 in the first and second chambers 43 and 44 of the chamber body 41, respectively.

The first boss 48 has a first axial bolt hole 49, while the second boss 50 has a second axial bolt hole 51. The chamber cover 42 has first and second through holes 52 and 53 at positions corresponding to the first and second bolt holes 49 and 51, respectively.

Therefore, when the bolts 54 are tightened to the first and second bolt holes 49 and 51 through the first and second through holes 52 and 53 with an appropriate torque, the chamber cover 42 is easily and simply mounted to the chamber body 41 as shown in FIG. 3. The process of bolting the chamber cover 42 to the chamber body 41 is performed with having no relation to the cylinder block 21, thus not deforming, damaging or breaking the cylinder block 21.

In the above-described embodiment, the present invention is adapted to a hermetic linear compressor. However, it should be understood that the present invention may be adapted to a hermetic reciprocating compressor, in addition to the hermetic linear compressor, without affecting the functioning of the present invention.

As apparent from the above description, the present invention provides a hermetic compressor, in which an exhaust chamber part to temporarily store therein compressed gas discharged from a cylinder bore prior to exhausting the compressed

gas to an outside of a hermetic casing, is integrally formed at a cylinder head, in place of a cylinder block. It is thus possible to simplify the structure of the cylinder block, so that the cylinder block is easily and simply produced.

In addition, a process of bolting a chamber cover to an open top of a chamber body of the exhaust chamber part is performed with having no relation to the cylinder block, so that the process is free from deforming, damaging or breaking the cylinder block. It is thus possible to precisely arrange a piston in the cylinder bore of the cylinder block with a minute clearance defined between the piston and the cylinder bore, so that gas leakage from a junction between the piston and the cylinder bore is prevented, and gas compression efficiency of the hermetic compressor is improved.

Furthermore, since the exhaust chamber part of the present invention is provided at the cylinder head, in place of the cylinder block, heat of the compressed gas temporarily stored in the exhaust chamber part is scarcely transmitted to the cylinder block. Therefore, a temperature of inlet gas which flows into the cylinder bore is not increased due to the cylinder block, so that volume efficiency of the inlet gas and gas compression efficiency of the hermetic compressor are improved.

Although a preferred embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.